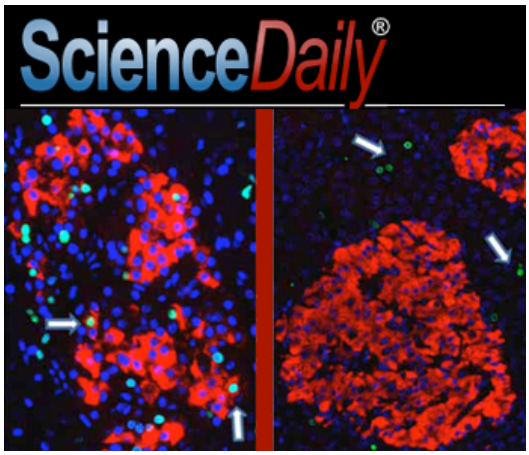
LAWRENCE LIVERMORE
# REPORT

**A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Nov. 1-5, 2010**

## Better treatment options for diabetes




**At left, a pancreatic islet from a 20-year-old subject, stained with IdU (green), insulin (red), and DAPI (blue). The two white arrows show two nuclei positive for IdU, completely surrounded with insulin, providing evidence for beta cell turnover. At right, pancreatic islets from a 45-year-old subject. There were no IdU-positive beta cells. The two white arrows represent cells that have divided outside of pancreatic islets.**

Beta cells, which make insulin in the human body, do not replicate after the age of 30, indicating that clinicians may be closer to better treating diabetes.

Type 1 diabetes is caused by a loss of beta cells by auto-immunity while type 2 is due to a relative insufficiency of beta cells. Whether beta cells replicate after birth has remained an open issue, and is critically important for designing therapies for diabetes.

By using radioactive carbon-14 produced by above-ground nuclear testing in the 1950s and '60s, researchers have determined that the number of beta cells remains static after age 30.

Lawrence Livermore scientist Bruce Buchholz, with collaborators from the National Institutes of Health, used two methods to examine adult human beta cell turnover and longevity. Using LLNL's Center for Accelerator Mass Spectrometry, Buchholz measured the amount of carbon 14

in DNA in beta cells and discovered that after age 30, the body does not create any new beta cells, thus decreasing the capacity to produce insulin as a person ages.

To read more, go to the Web.

**A star to be born**


**The main chamber at the NIF, where nuclear fusion could be obtained within two to three years.**

Scientists are serious about obtaining nuclear fusion and the National Ignition Facility was designed for this very purpose, and work there is progressing fast.

Experts want to obtain controlled fusion, the same source of energy that powers the sun and stars.

At the meeting of the American Physical Society, which will take place next week, NIF investigators will detail the progress made at the facility, which houses the most powerful laser in the world.

It's no secret that fossil fuels are diminishing and alternatives must be found.  Wind and solar probably won't be enough to sustain our needs. Fusion is a possible alternative in the energy mix .

Nuclear fusion works by fusing together deuterium and tritium -- two hydrogen isotopes. The reaction forms helium, which can be used for other applications such as rocket fuel, and emits a vast amount of energy.

To read more, go to the Web.

**Carbon nanotubes drive forward**


**An artist's rendering of carbon nanotubes.**

Researchers in carbon nanotubes, originally developed at Lawrence Livermore, have been awarded more than $100,000 by the California Energy Commission to apply the technology to curbing industrial pollution.

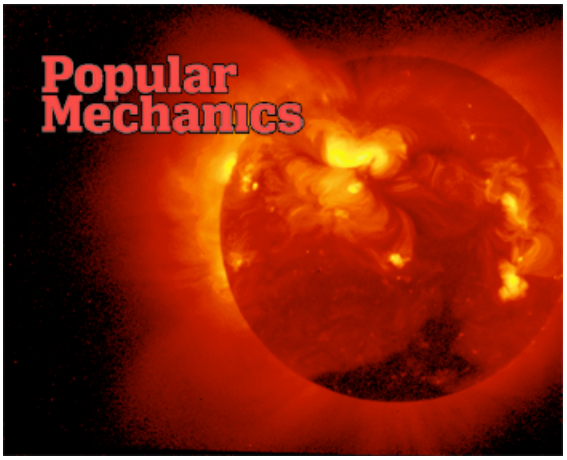
Hayward-based Porifera, Inc., headed by former LLNL scientist Olgica Bakajin, was awarded $115,397 for a project to research and develop carbon nanotube membranes to efficiently separate carbon dioxide from industrial emissions. The project has additional funding from an American Recovery and Reinvestment Act (ARRA) grant.

The goal of the project is to replace the chemical-based carbon dioxide separation technology with membrane-based technology. Carbon nanotube membranes are comprised of extremely small (about 10,000 times smaller than a human hair), strong hollow tubes made of graphite carbon atoms. Gas flows through these tubes 100 times faster than the pores in other types of membranes.

If successful, carbon nanotube membranes could potentially deliver better efficiency, lower energy consumption and provide cheaper carbon dioxide sequestration than the current process.

To read more, go to the Web.

**A stable way to store the sun's heat**




Lawrence Livermore scientist Yosuke Kanai working closely with MIT researchers has revealed how a molecule called fulvalene diruthenium works to store and release heat on demand.

The new finding should make it possible to find similar chemicals based on more abundant, less expensive materials than ruthenium, and this could form the basis of a rechargeable battery to store heat rather than electricity.

The molecule undergoes a structural transformation when it absorbs sunlight, putting it into a higher-energy state where it can remain stable indefinitely. Then, triggered by a small addition of heat or a catalyst, it snaps back to its original shape, releasing heat in the process.

But the team found that the process is a bit more complicated than that.  To find out why, go to the Web.

**Lab gets visual with GPU cluster**


Lawrence Livermore's Computing Center is getting a new visualization cluster called "Edge" that is geared to support data analysis and visualization projects. The clusters also will be used by code developers who are porting simulation codes to run on graphics processing units (GPUs)s.

The HyperPower Cluster Technology will be displayed at the SC 2010 Conference and Exposition in New Orleans, La., Nov. 15-18.

"LLNL scientists required a platform with the latest GPU technology in order to take advantage of the performance increases available to visualization tools and other application codes. Visualization specialists are dealing with multi-terabyte data sets with tens of billions of zones, thousands of files per time step, and hundreds of time steps," said Becky Springmeyer, computational systems and software environment lead of the Advanced Simulation and Computing program at LLNL.

To read more, go to the Web.

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